# Development of Corrosion-Resistant Molecular Sieve Inclusion Nanocomposite (MoSIN) Membranes to Recover Water from Urine through Osmotic Processes

Completed Technology Project (2012 - 2016)

## Project Introduction

The National Aeronautic and Space Administration (NASA) seeks to dramatically improve state-of-the art systems for water recovery and management for human health and habitation in space flight and travel. In particular, a long-term goal is to increase water recovery from wastewaters to create a closed-loop water recycling system. Currently, in the Water Recovery System (WRS) used on the International Space Station (ISS) only 70% of the wastewater generated is recovered; the remaining 30% of the water is brine that is stored for later disposal. Under this system, wastewater recycling is dependent on resupply of water from the ground to the ISS. Since NASA has retired the space shuttle fleet, the need to minimize use of ground-based resources is a higher priority. As a result, NASA faces the challenge of either developing new wastewater recycling systems or optimizing existing ones to maximize water recovery. Current osmotic processes – both reverse osmosis (RO) and forward osmosis (FO) – offer the potential to increase water recovery from wastewaters consisting of raw urine, pre-treated urine, and urine brines. However, commercial RO and FO membranes rapidly degrade in the presence of the acidic pre-treated urine and urine brines. Additionally, these commercial RO and FO membranes are flawed in that they are not a sufficient barrier to small organic compounds commonly found in urine, such as urea. In this research project, our lab at Arizona State University will develop a new class of corrosion-resistant Molecular Sieve Inclusion Nanocomposite (MoSIN) membranes and we will demonstrate their effectiveness for recovering water from urine and urine brine solutions through osmotic processes.

## Anticipated Benefits

NASA seeks to dramatically improve state-of-the art systems for water recovery and management for human health and habitation in space flight and travel. This project aims to develop a new class of corrosion-resistant Molecular Sieve Inclusion Nanocomposite (MoSIN) membranes and we will demonstrate their effectiveness for recovering water from urine and urine brine solutions through osmotic processes.


Project Image Development of Corrosion-Resistant Molecular Sieve Inclusion Nanocomposite (MoSIN) Membranes to Recover Water from Urine through Osmotic Processes

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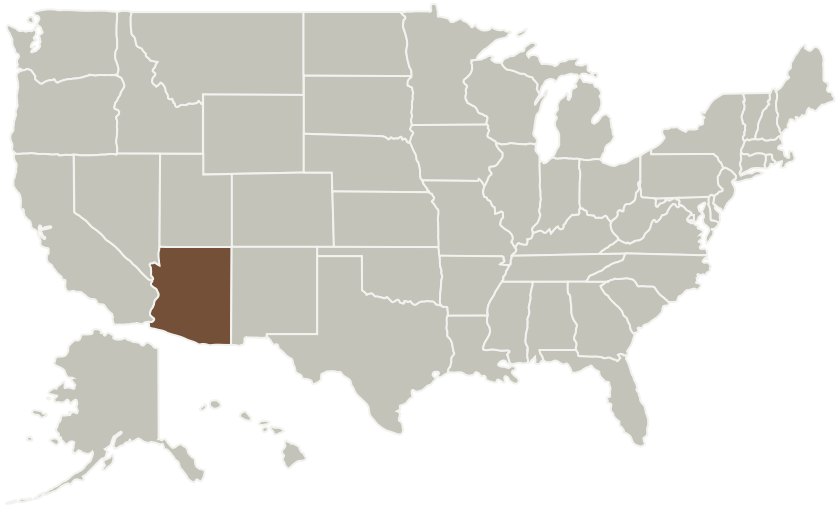
## Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|---|---|---|---|
| Arizona State University-Tempe(ASU) | Lead Organization | Academia<br>Alaska Native and Native Hawaiian Serving Institutions (ANNH) | Tempe, Arizona |

| Primary U.S. Work Locations |
|---|
| Arizona |

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Organization:**

Arizona State University-Tempe (ASU)

**Responsible Program:**

Space Technology Research Grants

## Project Management

**Program Director:**

Claudia M Meyer

**Program Manager:**

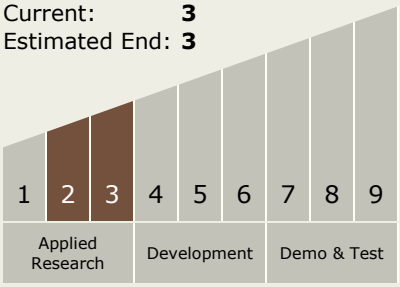
Hung D Nguyen

**Principal Investigator:**

Mary Lind

## Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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## Images


**11473-1363178295524.jpg**
Project Image Development of Corrosion-Resistant Molecular Sieve Inclusion Nanocomposite (MoSIN) Membranes to Recover Water from Urine through Osmotic Processes
*(https://techport.nasa.gov/image/1748)*

## Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

## Technology Areas

**Primary:**

- TX06 Human Health, Life Support, and Habitation Systems
  - TX06.1 Environmental Control & Life Support Systems (ECLSS) and Habitation Systems
    - TX06.1.2 Water Recovery and Management

## Target Destination

Mars